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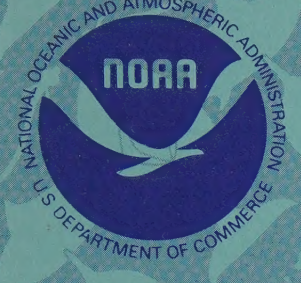

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PARASITES AS BIOLOGICAL INDICATORS OF THE DISTRIBUTIONS AND DIETS OF MARINE MAMMALS COMMON TO THE EASTERN PACIFIC

by

Murray D. Dailey

and

Katherine A. Otto

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PARASITES AS BIOLOGICAL INDICATORS OF THE DISTRIBUTIONS AND DIETS OF MARINE MAMMALS COMMON TO THE EASTERN PACIFIC

by

Murray D. Dailey and Katherine A. Otto
Department of Biology
California State University
Long Beach, California 90840

May 1982

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INTRODUCTION

Evidence indicating a parasite or group of parasites having biological tag potential has come from studies on marine and freshwater fishes (Gibson, 1972; Hare and Burt, 1976; Sunderman, 1961; Dick and Beloseric, 1978; Mackenzie, 1978). Results from such studies have indicated that these natural tags may provide a valuable means of differentiating fish populations and aid in gathering data on migration patterns, feeding habits and stock assessment.

Although these previous studies demonstrating the use of parasites as biological tags may be a standard for fishes, caution should be taken in applying the same type of data to marine-mammal parasites at this time. This is due to the paucity of information on parasites as biological tags in marine mammals, combined with only a generalized knowledge of parasite life cycles in those hosts.

Parasitic organisms have previously contributed to a better understanding of marine mammal populations. They have been implicated as causative agents of strandings (Dailey and Walker, 1978; Ridgway and Dailey, 1972). Stroud and Roffe (1979) determined that parasitism plays a primary role in the mortality of both stranded pinnipeds and cetaceans. Nematode parasites have been a factor in the mortality of pelagic cetaceans (Perrin and Powers, 1980). Phylogenetic information on pinnipeds in the USSR has been gathered by studying their parasitic fauna (Dailey, 1975; Delyamure, 1955).

The materials in this study were collected from two sources: pinnipeds and cetaceans stranded along the Oregon and Californian coasts, and cetaceans tangled in nets of tuna boats from the Eastern Tropical Pacific (as defined by Briggs, 1974).

The objectives of this study were to consolidate marine mammal parasite material from the Eastern Pacific and review the literature with

biological tag potential in mind, and to organize and tabulate data with regard to species, sex, and distributional limitations of marine mammals in the Eastern Pacific. In general, to lay the groundwork for the concept of biological tagging in pinnipeds and cetaceans. This study considered four species of pinnipeds (California sea lion, Zatophus californianus; Steller sea lion; Eumatopias jubatus northern elephant seal; Mirounga angustirostris; harbor seal, Phoca vitulina and five species of cetaceans (common dolphin, Delphinus delphis; striped dolphin, Stenella coeruleoalba; spinner dolphin, Stenella longirostris; Pacific white-sided dolphin, Lagenorhynchus obliquidens; spotted dolphin, Stenella attenuata). The last species is taxonomically unsettled and as such may also be listed as S. dubia, S. frontalis or S. plagiodon.

METHODS

Approximately 2,000 helminth parasites representing 28 genera and 49 species were recorded from 528 hosts collected from various localities in the Eastern Pacific. Host and parasite material from the Marineland, Palo Verdes, California, were either sent to CSULB and identified by the author, or sent as a necropsy report summarizing the parasites found in each host. All stranded marine mammals from Marineland were necropsied in a uniform manner by a veterinarian.

Previously published material is also listed (Tables 1 and 2, Appendix). Parasite material from the striped dolphin, Stenella coeruleoalba Meyen, 1833, was obtained from the National Marine Fisheries Service in La Jolla, California and identified by the author. Only one dolphin of this species, found stranded at Long Beach, was part of the Marineland Collection.

Preparation of helminths for examination followed standard procedures (Meyer and Olsen, 1980). Most frequently used fixatives were either AFA (alcohol, formalin, acetic acid) or four-percent formalin. Fixed specimens were transferred to 70-percent ethyl alcohol for storage. Stored helminths were subsampled. For identification, gross measurements for length and width of larger worms were made with a dissecting microscope equipped with an ocular micrometer and 2x magnifier. Measurements were recorded to the nearest tenth of a millimeter.

Cestodes, trematodes and acanthocephalans were stained in Semichon's carmine or celestine blue B, destained in one-percent acid alcohol, dehydrated in an ethanol series, cleared in methyl salicyate and mounted in Piccolyte. Nematodes were cleared in lactic acid and mounted in glycerine jelly.

Material to be sectioned was dehydrated in ethanol, cleared in toluene,

imbedded in paraffin and sectioned at ten microns. Sections were stained in Delafield's hematoxylin and counterstained with eosin.

Internal measurements were made with the aid of a calibrated ocular micrometer and recorded to the nearest tenth of a millimeter.

Raw data for each hsot species were tabulated. Parameters used included: date of stranding (or capture), locality, sex, length(cm), age class, location of parasite in host, parasite identification, and when available, number of parasites found in each host. Binary data were tabulated where only presence or absence of parasites were recorded at necropsy.

The Independent Sample Proportions Test (Tate and Clelland, 1957) was used to test the significance of difference between the incidence of infection for a given helminth species. As defined in this study, incidence of infection is the infection rate as a percent. Incidence for a given parasite was calculated by the following equation: number of host individuals infected with a given parasite species/pooled host sample size for a given host species. Host sample size for a given host species is the total number of host individuals pooled from the localities listed in Tables 1 and 2.

The following formula was used in the Independent Sample Proportions Test for k independent sample percentages with (k-1) degrees of freedom:

$$\chi^2_p = \frac{d}{\bar{p}(1 - \bar{p})}$$

$$\text{where} \quad d = \frac{x^2}{n} - \frac{(x)^2}{N}$$

$$\bar{p} = \frac{x}{N}$$

Data for each marine mammal host species were entered into a 2 x k contingency table for the parasite tested. The columns for each table were headed as follows: marine mammal, total number of hosts (n), number of hosts infected with parasite (x), incidence of infection (p), x^2, and x^2n.

Tabulated data were used in the equation for chi square of sample percentages (x_p^2). The calculated x_p^2 was compared with the probability table under k-1 degrees of freedom. The null hypothesis, which assumes that the population percentages are equal, was rejected when $p < 0.05$, indicating that the infection rates for a given parasite were significantly different between the two host species.

There was difficulty in applying this test in this study due to the disparity and low numbers in sample sizes for a given host species. This in part is due to the legal restrictions placed on the collection of marine mammals. Therefore, the reliability of the Independent Sample Proportions Test was examined by calculating $\bar{p}(n)$ and $1-\bar{p}(n)$, which are values taken from the x_p^2 equation for each host species for a given parasite. As defined in this study, reliability is the sensitivity of a test from which valid conclusions may be made. According to Tate and Clelland (1957), when the majority of expected values are five or more and none less than one, the test is considered reliable. However, there is some discrepancy in the literature in using five as the guideline for reliability. Cochran (1954, cited by Elliott, 1971) states that the use of five is a restriction that weakens the sensitivity of the x^2 test. He suggests that no expected values should be less than one in determining reliability. This discrepancy is taken into account when making conclusions on calculated expected values ($\bar{p}(n)$ and $1-\bar{p}(n)$ in this study.

RESULTS

Pinnipedia

Twenty-eight species of helminth parasites were recovered from four species of pinnipeds. Twelve nematodes, five trematodes, six cestodes, and five acanthocephalans comprised this group. No new host or locality records were found.

Infection Trends (Tables 3-6)

Two helminth species were shared by all four pinniped hosts. These were Anisakis simplex (Rudolphi, 1809); Baylis, 1920 and Pricetrema zalophi (Price, 1932); Ciurea, 1933. Those helminths found in one host species with an incidence greater than ten percent were Corynosoma villosum Van Cleave, 1953 from the Steller sea lion, Corynosoma bullosum (Linstow, 1892) and Otostrongylus circumlitus (Raillet, 1899); Bruyn, 1933 from the northern elephant seal, and Dipetalonema spirocauda (Leidy, 1858); Anderson, 1959 from the harbor seal. Helminths found in three host species with one host having an incidence not less than 36 percent were Terranova decipiens (Krabbe, 1878); Baylis, 1916, Corynosoma strumosum (Rudolphi, 1802); Lühe, 1904, Contracaecum osculatum (Rudolphi, 1802); Baylis, 1920 and Parafilaroides decorus Dougherty and Herman, 1947.

Cetacea

Twnety-one species of helminth parasites were recovered from five species of cetaceans. Six nematodes, six trematodes, six cestodes and three acanthocephalans comprised this group (Tables 7-10). A new host and locality record was recorded for the trematode Zalophotrema pacificum Dailey and Perrin, 1973. Adult helminths were found in the pancreas, bile duct, and liver of the striped dolphin with an incidence of six percent. Localities were off the coast of Central Mexico (20°6'N X 110°29'W) and off

the coast of Columbia (7°50'N X 86°30'W). The type hosts for Z. pacificum are the spinner dolphin Stenella longirostris (Schlegel, 1841) and the spotted dolphin, species common to the Eastern Tropical Pacific (Dailey and Perrin, 1973).

Infection Trends (Tables 7-10)

Two helminth species were shared by all five cetacean hosts. These were A. simplex and Monorygma grimaldii (Moniez, 1889); Baylis, 1919. Those parasites found in one host species with an incidence greater than 25 percent were Bolbosoma sp. adults and Anisakis sp. Larvae from the striped dolphin of Nasitrema globicephalae Neiland, Rice and Holden, 1970 and Nasitrema sp. were found in greater frequency in the common dolphin and the Pacific white-sided dolphin species stranded along the California and Oregon coasts. Parasites found in greater frequency in Cetacea of the Eastern Tropical Pacific, the striped dolphin, spinner dolphin and spotted dolphin were Tetrabothrium forsteri (Krefft, 1871); Fuhrmann, 1904, Phyllobothrium delphini (Boxc, 1802), M. grimaldii, Z. pacificum, Bolbosoma vasculosum (Rudolphi, 1819) and Bolbosoma balanae (Gmelin, 1790).

DISCUSSION

This study represents the first comprehensive review of data of marine mammal parasites from the Eastern Pacific, with a special interest on the possible application of helminths as biological tags. Results from this study contributes information on possible marine mammal distributions and diets and indicates helminths to be emphasized in future studies.

Pinnipedia

Interesting infection patterns are found in the acanthocephalan of the genus Corynosoma Luhe, 1904. Transmission of this parasite involves two intermediate hosts, a crustacean (either an amphipod or isopod) and a fish. The seal (definitive host) is infected by eating the infected fish (Dogiel, 1947, cited by Delyamure, 1955). Broad host tolerances have been demonstrated by species of Corynosoma, especially at stages which infect the fish or crustacean or both (Van Cleave, 1953b). Therefore, specificity is likely to be the result of the feeding habits of the seal host and the variety of animals utilized as intermediate hosts (Van Cleave, 1953b). This study supports the preceeding statements about the infectivity of Corynosoma. C. strumosum was recorded from all pinnipeds studied except the California sea lion (Table 6). Although C. osmeri (Fujita, 1921) was recorded by Lincicome (1943) from the California sea lion, Van Cleave (1953b) considered C. osmeri to be conspecific with C. strumosum, thereby making the California sea lion a host for this species.

This infection pattern indicates that the intermediate fish hosts must be available to both deep and/or shallow water feeders. Larval stages of C. strumosum have been reported from a wide variety of fish intermediate hosts from the Pacific Northwest and Canada (Van Cleave, 1953b). The ubiquitous nature of C. strumosum in Eastern Pacific pinnipeds limits this

species as a biological tag.

Corynosoma villosum was recorded only from the Steller sea lion with an incidence of 18 percent (Table 8). Localities for this host includes the Oregon coast and Triangle Island, British Columbia (Table 1, Appendix) which is the northern extension of its range. No records of C. villosum have been reported from this host's southern range along the California coast, indicating either the lack of intermediate hosts in the south or a change in the feeding habits of this sea lion. This helminth may therefore have tag potential for future population studies.

Van Cleave (1953a) has previously reported C. villosum from the Northern Fur seal, Callorhinus ursinus (Linnaeus, 1758) taken in the Pribilof Islands, Alaska. However, C. villosum has not been recorded from this host's southern population, which breeds on the San Miguel Island off the California coast. At this site, the Northern Fur seal, California sea lion and Steller sea lion are sympatric throughout the summer months (Dailey, 1975).

Another acanthocephalan, C. bullosum, was recorded only from the northern elephant seal, with an incidence of 16 percent (Table 6). Localities for this host include the Oregon and Calfornia coasts (Table 1, Appendix). Infection of C. bullosum in the northern elephant seal is not restricted to its northern range. It has also been reported from California waters (Schmidt and Dailey, 1971).

The occurrence of C. bullosum solely in the northern elephant seal reflects the deep feeding habits of this host in contrast to the two otariids. Ratfish are a common food item reported from stomachs of northern elephant seals. King (1964) states that ratfish are not taken in water of less than 50 fathoms, indicating the deep-water feeding

habits of this seal. Baylis (1929, cited by Schmidt and Dailey, 1971) reported larval forms of C. bullosum encysted in deep-water fish Parachaenichthys georgianus and Chaenocephalus aceratus from Antarctic waters. Therefore, this helminth could be used as a tag in verifying the feeding habits of the northern elephant seal.

Nematodes of the genera Anisakis, Contracaecum, and Terranova are ubiquitous and show a lack of specificity in their intermediate and definitive hosts (Dailey, 1975; Scott, 1953). Data listed in Table 5 confirms this for the genus Anisakis. All pinniped hosts were infected with Anisakis simplex with an incidence ranging from 0.5 to 16 percent. A significant difference of incidence of infection of C. osculatum and T. decipiens between pinniped species is indicated. With respect to biological tags, the results for these two nematodes should be taken with caution. The indicated significant difference does not reflect the ubiquitous nature of these stomach worms which excludes them from having biological tag potential.

Results of incidence of infection for P. decorus from the California sea lion and Steller sea lion (Table 5) concur with past reports for these sympatric hosts (Dailey, 1975). P. decorus has been established as the lungworm parasitic primarily in the California sea lion (Dailey, 1970). An 85 percent incidence from this host for this study confirms this conclusion (Table 5). Since the California sea lion is a resident of the Eastern Pacific with limited migration and without immigrant stocks (King, 1964) P. decorus has, consequently, no usefulness as a biological tag.

Results indicating an incidence of two percent (Table 5) for P. decorus in the northern elephant seal must be taken with caution. Species identification of Parafilaroides in this host is uncertain at this time due to the possibility of intraspecific variation of this helminth that is

influenced by the host. Further taxonomical work is needed through experimental infection to ascertain if the helminth is just a modified P. decorus.

The trematode P. zalophi was recorded in all four pinniped species studied with an incidence ranging from 0.5 to 21 percent (Table 4). Although significance of incidence of infection of P. zalophi between pinniped species is indicated, the application of this parasite as a biological tag is not feasible due to its ubiquitous nature.

Cetacea

Of the cetacean hosts studied, only the striped dolphin is found both in the Eastern Tropical Pacific and occasionally along the California coast (Hubbs, Perrin, and Balcomb, 1973; Sampson, 1970). The finding of Z. pacificum for the first time in the striped dolphin establishes the possibility of this dolphin's feeding habits following the pattern of the spinner dolphin and spotted dolphin, both type hosts for Z. pacificum from the Eastern Tropical Pacific (Dailey and Perrin, 1973).

The acanthocephalan of the genus Bolbosoma Porta, 1908 has been reported primarily from open-ocean cetaceans (Van Cleave, 1953b). In this study species of Bolbosoma were recorded exclusively from dolphins of the genus Stenella (Table 10). All localities recorded for these cetaceans for Bolbosoma were open ocean in the Eastern Tropical Pacific (Table 2, Appendix). Therefore, the results indicate that open-ocean intermediate hosts must be involved. Anisakis sp. larvae were recorded in the striped dolphin from the Eastern Tropical Pacific (68 percent incidence) and the Pacific white-sided dolphin from the California coast (8 percent incidence) (Table 2, Appendix; Table 9). Significance of incidence of infection of Anisakis, sp. larvae for the striped dolphin does not indicate biological

tag potential, due to the ubiquitous nature of this parasite, as mentioned previously for the pinnipeds. The presence of larval forms is probably due to the recent digestion of fish intermediate host species which harbor the larval stage (Dailey, 1969).

Tetrabothrium forsteri was recorded in dolphins from both the Eastern Tropical Pacific (39 to 40 percent incidence) and the Oregon and California coasts (5 percent incidence) (Table 2, Appendix; Table 7). Therefore, the ubiquitous nature of this parasite makes it less feasible as a biological tag.

The trematode of the genus Nasitrema Ozaki, 1935 has been implicated as the cause of single strandings in small cetaceans along the Southern California coast (Dailey and Walker, 1978). The taxonomic status of the species of this genus is unstable. Neiland et al. (1970) recognized nine species, seven of which were from the Eastern Pacific. However, Appy (1974), using a larger sample size, found several of these species (N. delphini, N. stenosoma, N. lanceolata) to be conspecific with N. globicephalae, thus reducing the species number in the Eastern Pacific to four. Identification of samples for this study utilized this synonomy.

The results of this study indicate a significant difference in the infection of Nasitrema sp. between dolphins stranded along the California and Oregon coasts and those tangled in tuna nets in the Eastern Tropical Pacific (Table 2, Appendix; Table 8). These results alone do not determine Nasitrema as a biological tag. Appy (1974) found immature N. globicephalae in large samples off Southern California, indicating a local focus of infection. Resolution of the taxonomic status of Nasitrema will allow specific identification for many samples used in this study. Differentiation of stocks of the common dolphin, Pacific white-sided dolphin, and striped dolphin would then be possible.

SUMMARY AND CONCLUSIONS

During the last ten years, approximately 2,000 helminth parasites were recovered from four pinniped and five cetacean host species. Parasites represented 28 genera and 49 species from various localities along the Eastern Pacific. These parasites were studied in order to determine their biological tag potential.

Raw data for each host species were tabulated. Parameters used included: date of stranding (or capture), locality, sex, length (cm), age class, location of parasite in host, parasite identification, and when available, number of parasites found in each host. Binary data were tabulated where only presence or absence of parasites were recorded at necropsy.

The Independent Sample Proportions Test was used to test the significance of difference between the incidence of infection for a given helminth species. As defined in this study, incidence of infection is the infection rate as a percent. Results from this test for parasites of Pinnipedia revealed that P. decorus, C. osculatum, T. decipiens, P. zalophi, C. strumosum, C. villosum, and C. bullosum have a significantly different incidence of infection between pinniped species. C. villosum may be used in distinguishing northern and southern ranges of Steller's sea lion. C. bullosum could be used as a tag in verifying the feeding habits of the northern elephant seal.

Results for parasites of Cetacea indicate that Anisakis sp. larvae, N. globicephalae, Nasitrema sp., T. forsteri, B. vasculosum and B. balanae have a significant difference of incidence of infection between cetacean species. Z. pacificum and Bolbosoma sp. may elucidate local populations and migration patterns of the striped dolphin along the Eastern Pacific. Specific identification of Nasitrema sp. in the common dolphin, Pacific

white-sided dolphin, and striped dolphin may aid in identifying local populations of these host species.

Specific problems were encountered during this project which I believe are unique to working with marine mammal parasites and marine mammals in general. These are the legal restrictions placed on the collection of marine mammals which limited host sources to stranded animals and animals tangled in tuna nets, and the variety of sources collecting material, that resulted in a difference in the degree with which an animal was examined for parasites. Therefore, the parasite infection data may not be representative of the entire host population.

Additional work should be carried out before definite conclusions are made about the biological tag potential of these parasites. Emphasis should be made in the future on examination of fish intermediate hosts for larval parasites, and the striped dolphin at different localities for host-specific parasites.

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Table 3. Cestodes recorded from four pinniped species common to the Eastern Pacific. Each host sample size is pooled from the localities listed in Table 1, Appendix.

Cestode	Pinniped Host			
	California sea lion	Steller sea lion	Northern elephant seal	Harbor seal
Diphyllobothrium pacificum (Nybelin, 1931); Margolis, 1956	1[a] (0.5)[b]	1 (4)	0	0
Diphyllobothrium cordatum (Leuckart, 1863)	0[c]	1 (4)	0	0
Diphyllobothrium sp.	3 (1.5)	3 (7)	0	0
Pyramicocephalus phocarum (Fabricius, 1789)	0	1 (4)	5 (12)	0
Diplogonoporus tetrapterus (Siebold, 1848)	0	1 (4)	0	0
Trigonocotyle sp.	0	0	1 (2)	0
Total # of Hosts	199	28	50	43

[a]Number of hosts infected with a given parasite (infection rate)

[b]Incidence--infection rate given as percent

[c]Parasite not found in listed pinniped

Table 4. Trematodes recorded from four pinniped species common to the Eastern Pacific. Each host sample size is pooled from the localities listed in Table 1, Appendix.

Trematode	Pinniped Host			
	California sea lion	Steller sea lion	Northern elephant seal	Harbor seal
Zalophotrema hepaticum Stunkard and Alvey, 1929	15[a] (8)[b]	3 (11)	0[c]	0
Zalophotrema sp.	1 (0.5)	0	0	0
Nanophytes salmincola Chapin, 1927	1 (0.5)	0	0	0
Pricetrema zalophi (Price, 1932); Ciurea, 1933	1 (0.5)	6 (21)	2 (5)	3 (6)
Rossicotrema venustus (Ransom, 1920)	0	0	0	1 (2)
Total # of Hosts	199	28	50	43

[a]Number of hosts infected with a given parasite (infection rate)

[b]Incidence--Infection rate given as percent

[c]Parasite not found in listed pinniped

Table 5. Nematodes recorded from four pinniped species common to the Eastern Pacific. Each host sample size is pooled from the localities listed in Table 1, Appendix.

Nematode	Pinniped Host			
	California sea lion	Steller sea lion	Northern elephant seal	Harbor seal
Parafilaroides decorus Dougherty and Herman, 1947	169[a] (85)[b]	4 (14)	1 (2)[c]	0[d]
Dipetalonema odendhali Perry, 1967	11 (6)	0	0	0
Dipetalonema spirocauda (Leidy, 1858); Anderson, 1959	0	0	0	8 (16)
Uncinaria sp.	1 (0.5)	0	0	0
Anisakis simplex (Rudlophi, 1809); Baylis, 1920	1 (0.5)	2 (7)	7 (16)	2 (4)
Anisakis sp.	0	0	1 (2)	4 (8)
Porrocaecum sp.	1 (0.5)	0	0	0
Contracaecum osculatum (Rudolphi, 1802); Baylis, 1920	2 (1)	17 (61)	0	9 (18)
Contracaecum sp.	0	0	0	1 (2)
Terranova decipiens (Krabbe, 1878); Baylis, 1916	0	18 (64)	3 (7)	18 (36)

Table 5. (Continued)

Nematode	Pinniped Host			
	California sea lion	Steller sea lion	Northern elephant seal	Harbor seal
Otostrongylus circumlitus (Railliet, 1899); Bruyn, 1922	0	0	5 (12)	0
Otostrongylus sp.	0	0	0	1 (2)
Total # of Hosts	199	28	50	43

[a]Number of hosts infected with a given parasite (infection rate)

[b]Incidence--infection rate given as percent

[c]Species determination of parasite in this host is uncertain

[d]Parasite not found in listed pinniped

Table 6. Acanthocephalans recorded from four pinniped species common to the Eastern Pacific. Each host sample size is pooled from localities listed in Table 1, Appendix.

Acanthocephalan	Pinniped Host			
	California sea lion	Steller sea lion	Northern elephant seal	Harbor seal
Corynosoma strumosum (Rudolphi, 1802); Luhe, 1904	0[a]	1[b] (4)[c]	1 (2)	21 (42)
Corynosoma villosum Van Cleave, 1953	0	5 (18)	0	0
Corynosoma semerme (Forssell, 1904); Luhe, 1911	0	0	0	2 (4)
Corynosoma bullosum (Linstow, 1892)	0	0	7 (16)	0
Corynosoma sp.	0	0	1 (2)	0
Total # of hosts	199	28	50	43

[a]Parasite not found in listed pinniped

[b]Number of hosts infected with a given parasite (infection rate)

[c]Incidence--infection rate given as percent

Table 7. Cestodes recorded from five cetacean species common to the Eastern Pacific. Each host sample size is pooled from the localities listed in Table 2, Appendix.

Cestode	Cetacean Host				
	Common dolphin	Striped dolphin	Spinner dolphin	Spotted dolphin	Pacific white-sided dolphin
Tetrabothrium forsteri (Krefft, 1871); Fuhrmann, 1904	3[a] (5)[b]	0[c]	7 (39)	33 (40)	0
Strobilocephalus triangularis (Diesing, 1850); Baer, 1932	1 (2)	0	1 (6)	7 (9)	0
Phyllobothrium delphini (Bosc, 1802)	4 (6)	0	8 (44)	33 (40)	2 (15)
Phyllobothrium sp.	3 (5)	2 (6)	0	1 (1)	3 (27)
Monorygma grimaldii (Moniez, 1889); Baylis, 1919	1 (2)	1 (3)	8 (44)	39 (48)	1 (8)
Monorygma sp.	8 (12)	1 (3)	1 (6)	7 (6)	0
Total # of Hosts	66	31	18	80	13

[a]Number of hosts infected with a given parasite (infection rate).

[b]Incidence--infection rate given as a percent

[c]Parasite not found in listed cetacean

Table 8. Trematodes recorded from five cetacean species common to the Eastern Pacific. Each host sample size is pooled from the localities listed in Table 2, Appendix.

Trematode	Cetacean Host				
	Common dolphin	Striped dolphin	Spinner dolphin	Spotted dolphin	Pacific white-sided dolphin
Nasitrema globicephalae (Neiland, Rice and Holden, 1970)	13[a] (20)[b]	1 (3)	0[c]	6 (7)	4 (31)
Nasitrema sp.	29 (44)	2 (6)	0	3 (4)	4 (31)
Campula rochebruni (Poirier, 1886)	8 (12)	0	1 (6)	4 (5)	0
Campula sp.	4 (6)	1 (3)	0	0	0
Zalophotrema pacificum (Dailey and Perrin, 1973)	0	2 (6)[d]	1 (6)	1 (1)	0
Zalophotrema sp.	0	0	0	1 (1)	0
Total # of Hosts	66	31	18	80	13

[a]Number of hosts infected with a given parasite (infection rate)

[b]Incidence--infection rate given as a percent

[c]Parasite not found in listed cetacean

[d]New host and locality record for this parasite

Table 9. Nematodes recorded from five cetacean species common to the Eastern Pacific. Each host sample size is pooled from the localities listed in Table 2, Appendix.

Nematode	Cetacean Host: Common dolphin	Striped dolphin	Spinner dolphin	Spotted dolphin	Pacific white-sided dolphin
Anisakis simplex (Rudolphi, 1809); Baylis, 1920	5[a] (8)[b]	9 (29)	12 (67)	45 (55)	4 (31)
Anisakis typica (Diesing, 1860); Baylis, 1920	0[c]	1 (3)	0	0	0
Anisakis sp. larvae	0	21 (68)	0	0	1 (8)
Mastigonema stenellae (Dailey and Perrin, 1973)	0	0	1 (6)	0	0
Halocercus delphini (Baylis et Daubney, 1925)	0	0	4 (22)	4 (5)	0
Crassicauda sp.	0	0	0	0	1 (8)
Total # of Hosts	66	31	18	80	13

[a]Number of hosts infected with a given parasite (infection rate)

[b]Incidence--infection rate given as a percent

[c]Parasite not found in listed cetacean

Table 10. Acanthocephalans recorded from five cetacean species common to the Eastern Pacific. Each host sample size is pooled from the localities listed in Table 2, Appendix.

Acanthocephalan	Cetacean Host				
	Common dolphin	Striped dolphin	Spinner dolphin	Spotted dolphin	Pacific white-sided dolphin
Bolbosoma vasculosum (Rudolphi, 1819)	0	3[b] (10)[c]	7 (39)	10 (12)	0
Bolbosoma balanae (Gmelin, 1970)	0	0	6 (33)	14 (17)	0
Bolbosoma sp.	0	8 (26)	0	0	0
Total # of Hosts	66	31	18	80	13

[a]Parasite not found in listed cetacean

[b]Number of hosts infected with a given parasite (infection rate)

[c]Incidence--infection rate given as a percent

APPENDIX

TABLES 1 - 2

Table 1. Pinnipeds recorded from the California, Oregon, and Alaskan coasts. Sources of material, including previously published material, are listed under each pinniped species.

Host	Length (cm)	Sex	Locality	Date
California sea lion				
1	ND [c]	ND	San Nicolas Is., CA (C)[a]	11-28-69
2	ND	ND	San Nicolas Is., CA (C)	7-23-68
Marineland Collection				
3	ND	ND	Pt. Magu, CA (S)[b]	8-02-68
4	ND	M	Santa Monica, CA (S)	12-07-69
5	119	M	Huntington Beach, CA (S)	3-05-70
6	139	M	Manhattan Beach, CA (S)	3-29-70
7	ND	F	Santa Monica, CA (S)	4-18-70
8	ND	F	Leo Carrillo State Beach, CA (S)	4-19-70
9	94	F	Zuma Beach, CA (S)	4-23-70
10	114	F	Malibu, CA (S)	4-24-70
11	ND	M	San Pedro, CA (S)	5-05-70
12	ND	M	San Pedro, CA (S)	6-07-70
13	ND	F	Manhattan Beach, CA (S)	5-12-70
14	103	M	Malibu, CA (S)	5-13-70
15	87	M	Long Beach, CA (S)	5-14-70
16	97	F	Santa Monica, CA (S)	5-18-70
17	96	M	Santa Monica, CA (S)	5-18-70
18	96	F	Redondo Beach, CA (S)	6-15-70
19	101	F	Santa Monica, CA (S)	7-03-70
20	107	M	Hermosa Beach, CA (S)	8-02-70
21	127	M	Santa Monica, CA (S)	8-14-70
22	115	M	Santa Monica, CA (S)	9-10-70
23	ND	M	Manhattan Beach, CA (S)	10-24-70
24	ND	F	Malibu Colony, CA (S)	11-18-70
25	116	M	El Segundo, CA (S)	11-14-70
26	104	M	Malibu, CA (S)	12-10-70
27	165	M	Redondo Beach, CA (S)	12-10-70
28	92	F	Malibu, CA (S)	12-17-70

Table 1. (Continued)

Host	Length (cm)	Sex	Locality	Date
29	97	F	Malibu, CA (S)	12-24-70
30	88	F	Santa Monica, CA (S)	1-03-71
31	ND	F	Redondo Beach, CA (S)	3-03-71
32	170	F	Will Rogers State Beach, CA (S)	5-16-71
33	138	F	Malibu, CA (S)	7-07-71
34	147	M	Cabrillo Beach, CA (S)	8-27-71
35	86	F	Malibu, CA (S)	7-15-71
36	117	F	Zuma Beach, CA (S)	9-27-71
37	173	M	Palos Verdes Peninsula, CA (S)	9-27-71
38	182	M	Zuma Beach, CA (S)	12-29-71
39	147	F	San Pedro, CA (S)	1-10-72
40	141	F	Santa Monica, CA (S)	1-17-72
41	110	M	Marineland (S)	2-07-72
42	177	M	Marina del Rey, CA (S)	2-10-72
43	ND	ND	Malibu Colony (S)	4-29-72
44	248	F	Malibu Colony (S)	6-02-72
45	115	M	Santa Monica (S)	7-02-72
46	110	M	Santa Monica (S)	7-10-72
47	120	M	Malibu Colony (S)	7-30-72
48	115	F	Malibu Colony (S)	11-12-72
49	125	ND	Malibu Colony (S)	9-13-72
50	115	M	Huntington Beach, CA (S)	10-26-72
51	111	F	Huntington Beach, CA (S)	10-09-72
52	123	M	Seal Beach, CA (S)	10-15-72
53	120	M	Huntington Beach, CA (S)	10-24-72
54	236	F	Malibu (S)	11-06-72
55	118	M	Santa Monica, CA (S)	11-11-72
56	223	F	Long Beach, CA (S)	11-22-72
57	175	M	Santa Monica, CA (S)	11-20-72
58	115	M	Manhattan Beach, CA (S)	11-27-72
59	113	F	Huntington Beach, CA (S)	12-04-72
60	120	M	Cabrillo Beach, CA (S)	12-13-72

Table 1. (Continued)

Host	Length (cm)	Sex	Locality	Date
61	163	F	Malibu (S)	12-30-72
62	144	M	Long Beach, CA (S)	1-09-73
63	145	M	Marineland (S)	1-26-73
64	107	M	Long Point (S)	1-25-73
65	110	M	Zuma Beach (S)	1-30-73
66	120	M	Balboa Peninsula, CA (S)	4-05-73
67	94	M	San Pedro (S)	2-09-73
68	125	M	Venice Beach, CA (S)	3-12-73
69	156	F	San Pedro (S)	4-13-73
70	121	M	Redondo Beach, CA (S)	4-05-73
71	100	F	San Pedro (S)	4-10-73
72	215	M	Huntington Beach, CA (S)	4-06-73
73	97	M	Playa del Rey, CA (S)	4-30-73
74	114	F	Redondo Beach, CA (S)	5-07-73
75	141	M	Hermosa Beach, CA (S)	5-15-73
76	104	F	Redondo Beach, CA (S)	6-04-73
77	138	M	Manhattan Beach, CA (S)	6-09-73
78	109	M	Malibu (S)	6-17-73
79	99	M	Santa Monica, CA (S)	7-21-73
80	165	F	Cabrillo Beach, CA (S)	7-08-73
81	111	M	Marina del Rey (S)	7-11-73
82	96	M	Long Beach, CA (S)	7-21-73
83	103	M	Redondo Beach, CA (S)	7-13-73
84	108	F	Malibu (S)	8-03-73
85	105	F	Long Beach, CA (S)	8-09-73
86	117	M	Will Rogers State Park (S)	8-15-73
87	111	F	Redondo Beach, CA (S)	8-21-73
88	107	F	Palos Verdes (S)	8-19-73
89	163	F	Torrance Beach, CA (S)	8-22-73
90	109	M	Long Beach, CA (S)	8-23-73
91	106	F	San Pedro, CA (S)	9-16-73
92	94	M	Long Beach, CA (S)	10-08-73
93	116	M	Malibu (S)	2-28-73

Table 1. (Continued)

Host	Length (cm)	Sex	Locality	Date
94	117	F	Long Beach, CA (S)	10-05-73
95	109	M	Malibu (S)	10-29-73
96	103	F	Will Rogers State Beach (S)	11-22-73
97	134	M	Redondo Beach, CA (S)	12-15-73
98	104	F	Santa Monica (S)	12-27-73
99	96	M	Malibu (S)	12-29-73
100	92	F	Redondo Beach (S)	1-29-74
101	ND	F	Malibu Beach, CA (S)	2-26-74
102	105	F	Abalone Cove, CA (S)	4-11-74
103	70	M	Abalone Cove, CA (S)	5-13-74
104	65	M	Huntington Beach, CA (S)	7-12-74
105	80	M	El Segundo Beach, CA (S)	7-01-74
106	63	F	Laguna Beach, CA (S)	7-09-74
107	75	F	Redondo Beach, CA (S)	8-12-74
108	100	M	Manhattan Beach, CA (S)	8-04-74
109	76	F	San Pedro, CA (S)	8-14-74
110	75	M	San Pedro, CA (S)	8-24-74
111	ND	F	Hermosa Beach, CA (S)	10-25-74
112	ND	M	Manhattan Beach, CA (S)	11-16-74
113	90	F	Redondo Beach, CA (S)	11-17-74
114	ND	F	Portuguese Bend, CA (S)	12-25-74
115	ND	F	Redondo Beach, CA (S)	1-01-75
116	ND	F	Redondo Beach, CA (S)	1-07-75
117	ND	F	San Pedro, CA (S)	4-25-75
118	ND	F	Cabrillo Beach, CA (S)	4-02-75
119	ND	F	Malibu (S)	4-14-75
120	ND	ND	Marina del Rey (S)	5-12-75
121	ND	M	Venice Beach, CA (S)	6-12-75
122	ND	M	San Pedro (S)	6-10-75
123	ND	F	Venice Beach, CA (S)	6-25-75
124	ND	M	Malibu (S)	7-02-75
125	ND	F	Portuguese Bend (S)	11-03-75
126	ND	F	San Pedro (S)	11-17-75

Table 1. (Continued)

Host	Length (cm)	Sex	Locality	Date
127	123	F	Abalone Cove (S)	5-01-76
128	ND	F	Santa Monica (S)	10-14-76
129	ND	F	Abalone Cove (S)	2-24-76
130	74	M	Hermosa, Beach, CA (S)	4-26-76
131	ND	M	Will Rogers State Beach (S)	5-06-76
132	ND	M	Palos Verdes (S)	5-13-76
133	ND	F	Malibu (S)	5-22-76
134	ND	M	Redondo Beach (S)	5-23-76
135	ND	M	Cabrillo Beach, CA (S)	6-07-76
136	ND	F	Malibu (S)	6-19-76
137	ND	F	Long Beach, CA (S)	6-15-76
138	ND	M	Hermosa Beach, CA (S)	&_)@_&¢
139	ND	F	Malibu Beach (S)	7-13-76
140	ND	M	Redondo Beach (S)	7-29-76
141	ND	M	Zuma Beach (S)	7-31-76
142	ND	M	Wilmington, CA (S)	8-10-76
143	ND	M	San Pedro, CA (S)	8-16-76
144	ND	F	Malibu (S)	9-23-76
145	ND	F	Hermosa Beach, CA (S)	12-05-76
146	ND	M	Cabrillo Beach, CA (S)	1-07-77
147	ND	M	Terminal Is., CA (S)	1-22-77
148	ND	F	Redondo Beach (S)	2-06-77
149	ND	M	Long Point (S)	2-08-77
150	ND	M	Hermosa Beach, CA (S)	2-16-77
151	ND	M	Terminal Island (S)	4-06-77
152	ND	F	Redondo Beach, CA (S)	4-21-77
153	ND	M	Torrance Beach, CA (S)	4-14-77
154	ND	F	Dockweiler, CA (S)	4-17-77
155	ND	M	Torrance Beach, CA (S)	4-18-77
156	ND	F	Hermosa Beach, CA (S)	4-18-77
157	ND	F	Playa del Rey (S)	4-18-77
158	ND	F	Paradise Cove, CA (S)	4-27-77
159	ND	M	Malibu Beach, CA (S)	4-21-77

Table 1. (Continued)

Host	Length (cm)	Sex	Locality	Date
160	ND	F	Long Beach, CA (S)	4-27-77
161	ND	M	Redondo Beach, CA (S)	5-05-77
162	ND	M	Long Beach, CA (S)	5-05-77
163	ND	M	Redondo Beach, CA (S)	5-14-77
164	ND	F	Catalina Is., CA (S)	5-12-77
165	ND	F	Long Point (S)	5-12-77
166	ND	M	Long Beach, CA (S)	5-15-77
167	ND	M	Redondo Beach (S)	5-14-77
168	ND	F	King Harbor, CA (S)	5-15-77
169	ND	M	Malibu (S)	5-16-77
170	ND	M	Long Beach, CA (S)	5-23-77
171	ND	M	Seal Beach, CA (S)	6-17-77
172	ND	F	Redondo Beach, CA (S)	6-06-77
173	ND	F	San Pedro, CA (S)	6-06-77
174	ND	F	Hermosa Beach, CA (S)	6-12-77
175	ND	M	Will Rogers St. Beach (S)	6-26-77
176	ND	M	Hermosa Beach, CA (S)	6-28-77
177	ND	F	Playa del Rey (S)	7-28-77
178	ND	M	El Segundo (S)	8-10-77
179	ND	F	Venice (S)	8-08-77
180	ND	M	Long Point, CA (S)	12-18-77
181	ND	F	Long Beach, CA (S)	11-14-77
182	ND	F	Manhattan Beach (S)	11-28-77
183	ND	F	Hermosa Beach, CA (S)	2-10-78
184	ND	M	Hermosa Beach, CA (S)	3-27-78
185	ND	F	Will Rogers St. Beach (S)	3-27-78
186	ND	F	San Pedro (S)	3-22-78
187	ND	M	Long Beach (S)	4-12-78
188	ND	F	Bolsa Chica, CA (S)	4-09-78
189	ND	M	Topanga, CA (S)	8-15-78
190	ND	M	Venica (S)	5-04-78
191	ND	F	Long Beach, CA (S)	5-04-78
192	ND	M	Hermosa Beach (S)	6-02-78
193	ND	F	Hermosa Beach (S)	5-27-78

Table 1. (Continued)

Host	Length (cm)	Sex	Locality	Date
194	ND	F	Santa Monica (S)	6-06-78
195	ND	ND	Long Beach (S)	6-12-78
196	ND	M	Hermosa Beach (S)	7-17-78
197	ND	M	Hermosa Beach (S)	8-21-78
Stroud and Dailey (1978)				
198	ND	ND	Oregon coast (S)	1976
199	ND	ND	Oregon cosst (S)	1977
Steller sea lion				
Stroud and Dailey (1978)				
1	ND	ND	Oregon coast (S)	1975
2	ND	ND	Oregon coast (S)	1975
3	ND	ND	Oregon coast (S)	1975
4	ND	ND	Oregon coast (S)	1975
5	ND	ND	Oregon coast (S)	1975
6	ND	ND	Oregon coast (S)	1975
7	ND	ND	Oregon coast (S)	1975
8	ND	ND	Oregon coast (S)	1975
9	ND	ND	Oregon coast (S)	1974
10	ND	ND	Cannon Beach, Oregon (S)	6-01-74
11	ND	ND	Cannon Beach, Oregon (S)	1976
12	ND	ND	Oregon coast (S)	1977
13	ND	ND	Fairbanks, Alaska	ND
Margolis (1956)				
14	ND	ND	Triangle Is., Br. Columbia (C)	6-53
15	ND	ND	Triangle Is. (C)	6-53
16	ND	ND	Triangle Is. (C)	6-53
17	ND	ND	Triangle Is. (C)	6-53
18	ND	ND	Triangle Is. (C)	6-53
19	ND	ND	Triangle Is. (C)	6-53
20	ND	ND	Triangle Is. (C)	6-53
21	ND	ND	Triangle Is. (C)	6-53
22	ND	ND	Triangle Is. (C)	6-53

Table 1. (Continued)

Host	Length (cm)	Sex	Locality	Date
23	ND	ND	Triangle Is. (C)	6-53
24	ND	ND	Triangle Is. (C)	6-53
25	ND	ND	Triangle Is. (C)	6-53
26	ND	ND	Triangle Is. (C)	6-53
27	ND	ND	Triangle Is. (C)	6-53
28	ND	ND	Triangle Is. (C)	6-53
Harbor seal				
Marineland Collection				
1	76	F	San Pedro (S)	5-16-70
2	89	F	Santa Monica (S)	7-15-70
3	75	F	San Pedro (S)	7-16-70
4	80	F	Santa Monica (S)	6-03-70
5	81	F	Malibu (S)	6-08-70
6	83	F	Newport Beach, CA (S)	5-05-70
7	85	M	Santa Monica (S)	6-08-70
8	ND	F	Santa Monica (S)	6-26-71
9	85	F	Santa Monica (S)	4-24-72
10	112	F	El Segundo (S)	11-30-72
11	106	M	Oxnard, CA (S)	12-12-72
12	137	M	Manhattan Beach (S)	3-22-73
13	85	M	El Segundo (S)	6-08-73
14	82	M	Cabrillo Beach (S)	6-09-73
15	79	F	Santa Monica (S)	6-26-73
16	124	ND	Oxnard (S)	9-28-73
17	ND	F	Portuguese Bend (S)	1-25-77
18	ND	ND	Monterey, CA (S)	6-02-78
19	ND	F	Malibu (S)	5-08-76
20	ND	M	Dockweiler (S)	5-22-76
21	ND	M	Redondo Beach (S)	5-27-76
22	ND	M	Manhattan Beach (S)	6-07-76
23	ND	F	Torrance Beach (S)	7-13-76
24	ND	F	Dockweiler (S)	8-02-76

Table 1. (Continued)

Host	Length (cm)	Sex	Locality	Date
Stroud and Dailey (1978)				
25	ND	ND	Oregon coast (S)	1974
26	ND	ND	Oregon coast (S)	1974
27	ND	F	Oregon coast (S)	1976
28	ND	F	Oregon coast (S)	1976
29	ND	ND	Oregon coast (S)	1976
30	ND	ND	Oreogn coast (S)	1976
31	ND	ND	Oregon coast (S)	1976
32	ND	ND	Oregon coast (S)	1977
33	ND	ND	Oregon coast (S)	1977
Margolis (1956)				
34	ND	ND	Skeena River, Brit. Columbia (C)	6-53
35	ND	ND	Skeena River (C)	6-53
36	ND	ND	Skeena River (C)	6-53
37	ND	ND	Skeena River (C)	6-53
38	ND	ND	Skeena Rvier (C)	6-53
39	ND	ND	Skeena River (C)	6-53
40	ND	ND	Skeena River (C)	6-53
41	ND	ND	Skeena River (C)	6-53
42	ND	ND	Skeena River (C)	6-53
43	ND	ND	Fraser River, Brit. Columbia (C)	9-51
44	ND	ND	Knight Inlet, Brit. Columbia (C)	9-51
45	ND	ND	Skeena River (C)	6-53
Taylor and Brown (1961)				
46	ND	M	Paradise Cove (C)	9-54
47	ND	F	Catalina Is. (C)	9-56
48	ND	M	Manhattan Beach (C)	7-57
49	ND	M	Malibu (C)	6-58
50	ND	F	Paradise Cove (C)	7-58
Northern elephant seal				
Marineland Collection				
1	ND	F	Cabrillo Beach (S)	2-14-70
2	ND	F	Santa Monica (S)	10-21-70

Table 1. (Continued)

Host	Length (cm)	Sex	Locality	Date
3	161	M	Zuma Beach (S)	2-17-72
4	154	M	Zuma Beach (S)	2-21-72
5	136	M	Malibu Colony (S)	6-30-72
6	146	F	Malibu (S)	12-01-72
7	149	F	Terminal Is. (S)	12-31-72
8	154	M	Protuguese Bend (S)	1-07-73
9	166	M	Portuguese Bend (S)	1-18-73
10	163	F	Playa del Rey (S)	2-14-73
11	179	M	Long Beach (S)	4-05-73
12	153	F	Leo Carrillo St. Beach (S)	7-07-73
13	ND	F	Redondo Beach (S)	9-12-74
14	ND	M	Torrance Beach (S)	2-19-75
15	ND	M	Manhattan Beach (S)	2-19-75
16	ND	M	Abalone Cove (S)	2-28-75
17	ND	ND	Malibu (S)	4-29-75
18	ND	F	Malibu (S)	6-25-75
19	ND	F	Redondo Beach (S)	1-06-78
20	ND	M	Redondo Beach (S)	4-03-78
21	ND	ND	Pt. Mugu (S)	2-69
22	ND	ND	Long Beach (S)	2-13-79
23	ND	F	Cabrillo Beach (S)	6-03-76
24	ND	M	Redondo Beach (S)	7-01-76
25	ND	F	Palos Verdes (S)	11-29-76
26	ND	F	Cabrillo Beach (S)	1-21-77
27	ND	M	Malibu (S)	1-26-77
Stroud and Dailey (1978)				
28	ND		Lincoln City, Oregon (S)	3-14-73
29	ND	M	Newport, Oregon (S)	3-14-73
30	ND	ND	Oregon coast (S)	1975
31	ND	M	Newport, Oregon (S)	2-24-73
32	ND	ND	Oregon coast (S)	1975
33	ND	ND	Oregon coast (S)	1976
34	ND	ND	Oregon coast (S)	1976

Table 1. (Continued)

Host	Length (cm)	Sex	Locality	Date
35	ND	ND	Oregon coast (S)	1976
36	ND	ND	Oregon coast (S)	1977
37	ND	ND	Oregon coast (S)	1978
38	ND	ND	Oregon coast (S)	1978
39	ND	ND	Oregon coast (S)	1978
40	ND	ND	Oregon coast S()	1978
41	ND	ND	Oregon coast (S)	1978
42	ND	ND	Oregon coast (S)	1978
43	ND	ND	Oregon coast (S)	1978

[a](C) denotes captured animals

[b](S) denotes stranded animals

[c]ND indicates data was not available

Table 2. Cetacea recorded from the California and Oregon coasts and the Eastern Tropical Pacific. Sources of material, including previously published material, are listed under each cetacean species. Latitude and longitudes are given for open ocean localities.

Host	Length (cm)	Sex	Locality	Date
Common dolphin				
Marineland Collection				
1	193	M	San Diego, CA (S)[a]	1-07-67
2	226	M	Cabrillo Beach, CA (S)	8-04-70
3	184	F	LA Airport Beach, CA (S)	8-04-70
4	224	F	Bolsa Chica St. Beach (S)	12-22-70
5	186	F	Bolsa Chica St. Beach (S)	7-08-70
6	197	M	Will Rogers St. Beach (S)	7-28-70
7	184	F	Playa del Rey, CA (S)	8-04-70
8	225	M	Hermosa Beach, CA (S)	2-23-70
9	186	F	Bolsa Chica St. Beach (S)	ND
10	168	ND[c]	Santa Monica (S)	8-04-71
11	182	ND	Santa Monica (S)	8-08-71
12	174	ND	Long Beach (S)	10-01-71
13	182	ND	Santa Monica (S)	8-01-71
14	188	ND	Long Beach (S)	4-16-71
15	204	ND	Malibu (S)	8-26-71
16	191	ND	Manhattan Beach (S)	6-06-71
17	190	ND	Will Rogers St. Beach (S)	10-08-72
18	194	ND	Leo Carrillo St. Beach (S)	12-29-72
19	175	ND	Bolsa Chica St. Beach (S)	5-03-72
20	186		Malibu (S)	6-07-72
21	197		San Gabriel River, CA (S)	7-12-72
22	194		Leo Carrillo St. Beach (S)	12-29-72
23	172		Venice Beach, CA (S)	8-12-72
24	198		Redondo Beach, CA (S)	4-18-72
25	186		Malibu (S)	6-07-72
26	193	ND	Bolsa Chica St. Beach (S)	8-11-73
27	189	ND	Will Rogers St. Beach (S)	8-07-73
28	181	ND	Manhattan Beach (S)	7-14-73
29	193	ND	Manhattan Beach (S)	7-14-73

Table 2. (Continued)

Host	Length (cm)	Sex	Locality	Date
30	195	ND	Terminal Is. (S)	12-31-73
31	195	ND	Zuma Beach (S)	5-05-73
32	171	ND	Zuma Beach (S)	8-08-73
33	195	ND	Malibu (S)	8-27-73
34	226	ND	Malibu (S)	4-02-73
35	195	M	Long Beach (S)	12-31-73
36	190	M	Leo Carrillo St. Beach (S)	3-08-74
37	171	F	Manhattan Beach (S)	3-15-74
38	198	M	Santa Monica (S)	4-02-74
39	193	M	Dominguez Channel, CA (S)	4-12-74
40	201	M	Santa Monica (S)	5-12-74
41	88	F	Torrance Beach, CA (S)	6-01-74
42	ND	M	Seal Beach, CA (S)	7-09-74
43	ND	F	Malibu (S)	7-26-74
44	ND	F	Cabrillo Beach (S)	8-24-74
45	ND	M	Corona del Mar, CA (S)	8-25-74
46	ND	F	Santa Monica (S)	9-14-74
47	ND	M	Zuma Beach (S)	9-17-74
48	ND	M	Topanga, CA (S)	3-21-75
49	ND	ND	Long Beach (S)	4-13-75
50	ND	M	Redondo Beach (S)	4-26-75
51	ND	F	Terminal Is. (S)	5-28-75
52	ND	M	Zuma Beach (S)	7-14-75
53	ND	M	San Pedro (S)	7-15-75
54	ND	F	Venice Beach (S)	8-16-75
55	ND	F	Zuma Beach (S)	8-20-75
56	ND	M	Redondo Beach (S)	9-18-75
57	ND	M	Malibu (S)	3-05-75
58	ND	M	Will Rogers STate Bch. (S)	4-25-75
59	ND	M	Malibu (S)	9-18-75
60	ND	F	Newport Beach (S)	3-05-76
61	ND	F	Newport Beach (S)	4-27-76
62	ND	F	Royal Plams Beach, CA (S)	7-16-76
63	ND	F	Manhattan Beach (S)	11-21-76

Table 2. (Continued)

Host	Length (cm)	Sex	Locality	Date
64	ND	F	Newport Beach (S)	3-28-77
65	ND	M	Manhattan Beach (S)	4-17-80
Stroud and Dailey (1978)				
66	ND	ND	Oregon coast (S)	1975
Striped dolphin				
National Marine Fisheries Service, La Jolla, California				
1	206	M	7°46'N X 84°20'W (T)[b]	9-04-73
2	192	F	7°46'N X 84°20'W (T)	9-04-73
3	236	ND	Long Beach (S)	3-21-73
4	193	M	17°53'N X 105°6'W (T)	5-11-74
5	192	F	7°50'N X 86°30'W (T)	2-05-74
6	187	M	17°52'N X 105°6'W (T)	5-12-74
7	192	F	7°5'N X 100°21'W (T)	8-14-75
8	187	M	17°53'N X 105°6'W (T)	5-15-75
9	207	M	9°41'N X 98°7'W (T)	2-19-75
10	195	F	18°25'N X 110°48'W (T)	2-23-75
11	201	M	9°41'N X 98°7'W (T)	2-19-75
12	148	M	9°41'N X 98°7'W (T)	2-19-75
13	195	F	18°25'N X 17°43'W (T)	2-28-75
14	195	F	18°25"N X 110°48'W (T)	2-28-75
15	209	M	20!6'N X 110°29'W (T)	1-07-75
16	186	F	3°16'S X 91°51'W (T)	2-22-76
17	204	M	3°16'S X 91°51'W (T)	2-22-76
18	191	F	3°16'S X 91°51'W (T)	2-22-76
19	156	F	3°16'S X 91°50'W (T)	2-22-76
20	213	M	3°16'S X 91°50'W (T)	2-22-76
21	155	F	3°16'S X 91°51'W (T)	2-22-76
22	189	F	3°16'S X 91°51'W (T)	2-22-76
23	183	F	4°50'S X 88°12'W (T)	2-08-76
24	192	M	4°50'S X 88°12'W (T)	2-08-76
25	188	M	9°1'S X 92°2'W (T)	12-13-78
26	194	M	9°1'S X 92°2'W (T)	12-13-78

Table 2. (Continued)

Host	Length (cm)	Sex	Locality	Date
27	180	M	9°1'S X 92°2'W (T)	12-13-78
28	201	F	10°30'N X 130°18'W (T)	8-08-78
29	178	F	9°1'S X 92°2'W (T)	12-13-78
30	182	F	9°1'S X 92°2'W (T)	12-13-78
31	192	M	9°1'S X 92°2'W (T)	12-13-78
Spinner dolphin				
Dailey and Perrin (1973)				
1	173	F	7°11'N X 90°32'W (T)	4-12-68
2	177	F	12°15'N X 93°18'W (T)	4-09-68
3	157	F	8°N X 107°W (T)	3-28-69
4	109	F	8°N X 107°W (T)	3-26-69
5	105	F	8°N X 109°45'W (T)	4-05-69
6	173	M	8°N X 107°W (T)	3-26-69
7	173	F	8°N X 107°W (T)	3-26-69
8	176	F	8°N X 107°W (T)	3-26-69
9	168	F	8°N X 107°W (T)	3-28-69
10	118	M	12°51'N X 93°18'W (T)	4-12-68
11	119	M	12°51'N X 93°18'W (T)	4-09-68
12	140	F	12°51'N X 93°18'W (T)	4-09-68
13	149	F	7°11'N X 89°32'W (T)	4-12-68
14	127	M	8°N X 109°45'W (T)	ND
15	162	F	14°N X 108°W (T)	ND
16	164	M	14°N X 100°W (T)	ND
17	165	M	14°N X 100°W (T)	ND
18	164	F	8°15'N X 104°34'W (T)	4-14-75
Spotted dolphin				
Dailey and Perrin (1973)				
1	200	M	11°N X 90°32'W (T)	4-12-68
2	185	F	10°28'N X 104°5'W (T)	10-23-72
3	174	F	10°28'N X 104°5'W (T)	10-23-72
4	199	M	10°28'N X 104°5'W (T)	10-23-72
5	200	M	10°28'N X 104°5'W (T)	10-23-72
6	202	M	10°28'N X 104°5'W (T)	10-23-72

Table 2. (Continued)

Host	Length (cm)	Sex	Locality	Date
7	ND	ND	13°N X 109°W (T)	10-19-72
8	205	M	10°28'N X 104°5'W (T)	10-23-72
9	191	F	10°8'N X 104°5'W (T)	1972
10	222	M	8°34'N X 85°14'W (T)	4-07-73
11	170	F	Off Costa Rica, Columbia (T)	3-69
12	174	F	7°11'N X 90°32'W (T)	4-12-68
13	200	M	7°11'N X 90°32'W (T)	4-12-68
14	157	M	7°11'N X 90°32'W (T)	4-12-68
15	193	F	7°11'N X 90°32'W (T)	4-12-68
16	168	F	8°N X 107°W (T)	3-27-69
17	165	M	12°51'N X 93°18'W (T)	4-09-68
18	198	M	8°N X 107°W (T)	3-27-69
19	182	F	12°51'N X 93°18'W (T)	4-12-68
20	142	F	7°11'N X 90°32'W (T)	4-12-68
21	185	F	12°51'N X 93°18'W (T)	4-09-68
22	167	M	12°51'N X 93°18'W (T)	4-09-68
23	218	M	7°11'N X 90°32'W (T)	4-12-68
24	144	M	7°11'N X 90°32'W (T)	4-12-68
25	203	M	7°11'N X 90°32'W (T)	4-12-68
26	190	M	12°41'N X 93°18'W (T)	4-09-68
27	154	M	12°51'N X 93°18'W (T)	4-12-68
28	195	M	12°51'N X 93°18'W (T)	4-12-68
29	190	F	12°51'N X 93°18'W (T)	4-09-68
30	162	M	12°51'N X 93°18'W (T)	4-09-68
31	168	M	12°51'N X 93°18'W (T)	4-09-68
32	139	M	7°11'N X 90°32'W (T)	4-12-68
33	163	F	12°51'N X 93°18'W (T)	4-09-68
34	135	M	7°11'N X 90°32'W (T)	4-12-68
35	179	M	12°51'N X 93°18'W (T)	4-09-68
36	174	F	7°11'N X 90°32'W (T)	4-12-68
37	136	F	7°11'N X 90°18'W (T)	4-12-68
38	143	F	7°11'N X 90°32'W (T)	4-09-68
39	168	M	7°11'N X 90°32'W (T)	ND

Table 2. (Continued)

Host	Length (cm)	Sex	Locality	Date
40	158	M	7°11'N X 90°32'W (T)	4-12-68
41	180	M	12°51'N X 93°18'W (T)	3-09-68
42	182	F	12°51'N X 93°8'W (T)	4-09-68
43	188	F	7°11'N X 9032'W (T)	4-12-68
44	160	M	12°51'N X 93°18'W (T)	4-09-68
45	175	F	7°11'N X 90°32'W (T)	4-12-68
46	165	F	12°51'N X 93°18'W (T)	4-09-68
47	177	M	12°51'N X 93°18'W (T)	4-12-68
48	168	F	7°11'N X 90°32'W (T)	4-12-68
49	79	F	7°11'N X 90°32'W (T)	4-09-68
50	176	M	7°11'N X 90°32'W (T)	4-12-68
51	153	M	12°51'N X 93°18'W (T)	4-09-68
52	144	F	12°51'N X 93°18'W (T)	4-09-68
53	193	F	12°51'N X 93°18'W (T)	4-09-68
54	164	F	12°51'N X 93°18'W (T)	4-09-68
55	163	M	12°51'N X 93°18'W (T)	4-12-68
56	162	M	12°51'N X 93°18'W (T)	4-05-69
57	138	ND	12°51'N X 93±18'W (T)	4-09-68
58	172	ND	7°11'N X 93°18'W (T)	4-09-68
59	166	F	12°51'N X 93°18'W (T)	4-12-68
60	168	M	12°51'N X 93°18'W (T)	4-09-68
61	182	F	12°51'N X 90°18'W (T)	4-12-68
62	202	M	7°11'N X 90°32'W (T)	4-12-68
63	200	M	7°11'N X 90°32'w (T)	4-12-68
64	173	M	12°51'N X 93°18'W (T)	4-09-68
65	159	M	8°N X 107°W (T)	3-27-69
66	184	F	12°51'N X 93°18'W (T)	4-09-68
67	178	M	7°11'N X90°32'W (T)	4-12-68
68	163	M	7°11'N X 90°32'W (T)	4-12-68
69	130	M	12°51'N X 93°18'W (T)	4-09-68
70	143	M	7°11'N X 90°32'W (T)	4-12-68
71	184	F	12°5'N X 93°18'W (T)	4-09-68
72	187	ND	14°N X 100°W (T)	

Table 2. (Continued)

Host	Length (cm)	Sex	Locality	Date
73	125	F	14°13'N X 99°10'W (T)	10-31-69
74	130	M	14°N X 108°W (T)	ND
Pacific white-sided dolphin				
Marineland Collection				
1	ND	ND	46°15'N X 128°38'W (S)	ND
2	ND	ND	Bolsa Chica (S)	ND
3	192	ND	Abalone Cove, CA (S)	4-16-71
4	172	ND	Topanga (S)	5-30-71
5	160	ND	Manhattan Beach (S)	7-26-71
6	167	ND	Marina del Rey (S)	8-15-71
7	197	ND	Santa Monica (S)	9-19-71
8	199	ND	Paradise Cove (S)	3-04-72
9	176	ND	Long Beach (S)	9-02-72
10	150	ND	Playa del Rey (S)	8-06-72
11	ND	ND	Will Rogers St. Beach (S)	4-25-75
12	ND	ND	Hermosa Beach (S)	7-31-76
13	190	ND	Cabrillo Beach (S)	3-08-74

[a](S) denotes stranded animals

[b](T) denotes animals tangled in tuna nets

[c]ND indicates data was not available